

ABoVE Full SDT Telecon – April 17, 2013

Attendees: Sharon Billings, Natalie Boelman, Steve Colt, Scott Goetz, Peter Griffith, Guido Grosse, Bob Harriss, Dan Hayes, Jeremy Karchut, Eric Kasischke, Libby Larson, Michelle Mack, Dave McGuire, Juha Metsaranta, Chip Miller, Mike Rawlins, Rob Striegl, Diane Wickland; Rapporteur: Elizabeth Hoy

Agenda:

- 1) Our charge for the call – Review of Current ABoVE Guidance and the charge to the group
- 2) Open “roundtable” discussion on the overarching theme

Overview of Current Guidance on ABoVE (from Eric’s Email)

- 1) The geographic study domain for ABoVE is the Arctic-Boreal Region (ABR) of Western North America (i.e. Alaska and western Canada).
- 2) ABoVE is to be an explicitly regional-scale study focusing on vulnerability – thus considering the responses to and impacts of climate change in the ABR.
- 3) ABoVE aims to develop an improved understanding of interactions within and between the terrestrial ecosystem and societal domains of the ABR, recognizing that these regional-scale interactions are a) driven by global-scale forcings and b) a function of local-to-regional scale processes.

Diane W. – Understanding individual perspectives will help us define science questions and determine study design. Think big picture level, not sub discipline level.

Today’s discussion is of the most important things that ABoVE should study. We are looking for common themes. Don’t change your mind based on what others say.

Roundtable Discussion

SDT Member Comment (written comments as unavailable for call)

"My "thing" is the net impact to the atmospheric CO₂ and CH₄ based on observed changes in state variables that include among other things, ground/air temperature and humidity. Other drivers such as snow cover and ecological changes will all need to be considered as drivers for changing net fluxes of CO₂ and CH₄ to the atmosphere but sorting out these changes will be harder to do."

SDT Member Comment (written comments as unavailable for call)

"If I have to pick one, then I'd go with change in soil carbon."

In my view this is the one the most interesting climate change Arctic topics. Our estimates of Arctic carbon stocks are enormously all over the place. Even if we did know the stocks, we don't have a good understanding of what controls the release, how much will be released, and the timing and spatial extent of soil flux change.

So, we'll need to have good spatial sampling of carbon stocks along with building the predictive modeling capacity to match those measurements. We'll need to have freeze-thaw dynamics down. We'll want to know if the carbon will be released as CO₂ or CH₄. We'll want to know how much is offset by any greening of the Arctic or increased vegetation productivity."

SDT Member Comment

Most important issue is understanding subsistence resources used by local people (from the social science perspective). The broader perspective is that ecosystem services are the best way to conceptualize any set of questions (including what is in the revised executive summary). NASA has a remote sensing advantage that could be used to test hypotheses with relevance to ecosystem services to local people.

SDT Member Comment

Mobilization of old carbon (how much, what, where, when, etc). On macroscopic scale, competition between photosynthesis and respiration and how this impacts the carbon balance. Also important is ecosystem vulnerability, the temperature derivative vs the time derivative.

SDT Member Comment

Balance of positive and negative feedbacks (similar to comments of others). Also there is a modeling component – how do we validate predictions of the models that are used?

SDT Member Comment

Processes of carbon transfer between land-atmosphere and land-ocean. What are the major drivers and factors of carbon transfer vertically and horizontal including photosynthesis and respiration. Implicit in this is understanding uncertainties such as those in air temperature, precipitation, soil characteristics (such as temperature). These processes are occurring on multiple spatial scales.

SDT Member Comment

Understand changes in ecosystem services; this encompasses many issues, including climate feedbacks, but also addresses provisioning services of the ecosystem as well as cultural and spiritual services. This focus also allows the engagement of many stakeholders, not just earth system modeling community but local natural resource managers and the community in Alaska.

SDT Member Comment

What is the role of permafrost degradation in altering water and carbon cycles in Arctic regions?

SDT Member Comment

Climate forcing should be only part of a much broader and all-encompassing question. ABoVE has the opportunity to focus on a wide range of ecological questions. A focus on disturbance (as Michelle alluded to) is important, but we need to be careful to make sure we consider other important ongoing changes (ie. expansion of woody deciduous shrubs, just as one example) that could have huge wide ranging ecological consequences (whether tipping points are reached or not).

SDT Member Comment

Human dimensions and impacts to humans and societies are important. Question 2 of the 4 science questions covers this – how people at local and region scales respond to climate change. At local levels, this covers “to what extent are people resilient and vulnerable to climate change?” A critical societal issue is “Could the benefits of climate change offset the costs?” It is important that ABoVE determine how it can engage local communities, as well as see what lessons local communities have for ABoVE researchers.

SDT Member Comment

Narrow focus: the balance between albedo feedbacks and net ecosystem carbon balance, including the effects of permafrost, albedo, radiative forcing feedbacks and carbon feedbacks.

SDT Member Comment

Interactions between climate and disturbance regimes and how they affect carbon; nutrient BGC understanding is good. Disturbances can rapidly alter carbon in Arctic. We also need meaningful scaling to the landscape. NASA can do landscape scale assessments of disturbance effects and it is important to understand changing disturbance patterns at the landscape scale. It is also important to understand how regime changes may be altering the age structure on the landscape and the impacts of different recovery times post-disturbance.

SDT Member Comment

Two Categories: 1 – Soil organic carbon destabilization – photosynthesis and respiration are well characterized, but changes in the future are not known and understanding net impacts is important. Microbial changes are non-deterministic. Research projects to use microbial models will be important in the future. 2 – What contribution is NASA best poised to make? Remote sensing is a major potential contribution. We need to think carefully to see how we can use remote sensing to test hypotheses, not just quantify and correlate observations (e.g. – how vegetation might change over time with a changing climate).

SDT Member Comment

I agree with previous points raised by others on changing the soil carbon dynamics as a regional process with global feedback potential as well as the spatial/temporal characterization of disturbances of all sorts.

NASA's unique strength are the tools and techniques to facilitate spatially explicit observations of changes for the entire region (or large parts of it) - this potential for providing spatially explicit resources/datasets should be at the core of ABoVE.

As a specific parameter that integrates over a variety of ecosystem parameters (permafrost thaw, disturbances, hydrology, ecosystem feedbacks) in ABR I believe seasonal and multi-annual land surface subsidence would be a great observation that NASA ABoVE could deliver.

SDT Member Comment

Integrations of various types of observations of ecosystems across space and time. Not just carbon-nitrogen cycles, but consider including mercury to link the project more closely to societal issues.

SDT Member Comment

Main issue is scaling – inspired by talks between DOE and NASA. Remote sensing is NASA's big contribution. Understanding processes or mechanisms at the landscape scale is needed. Current research is at the local scale (field work) and the larger scale (many models at climate grid cell). Need to connect these two at a landscape scale as there is a gaping hole in the middle. Ecological and societal domains could both be included at the landscape scale.

SDT Member Comment

Following what others have said, it is important to understand the interactions between the global and local scale processes that are driving change. We should not only look at soil carbon changes, but at what is causing those changes. This type of analysis would include interactions between disturbance, permafrost and ecosystem dynamics. These will drive changes and need to be understood.

SDT Member Comment

Following some of the comments of others, the issues of scaling and of understanding ecosystem services should both be considered.

SDT Member Comment

How do [global-scale] climate forcing and [local-to-regional scale] disturbances change permafrost soils and associated vegetation, impact vulnerability of ecosystems and affect local, regional, and global society?

SDT Member Comment

Vulnerability of ecosystems to the integrated changes in the arctic and boreal systems of North America (Alaska and western Canada), including both ecological (such as hydrology, etc.) and societal components.

General Discussion

Eric K. – Good that people thought about unique contribution to NASA

- SDT Member Comment – While not a remote sensing user currently, she hopes that there could be experiments within the arctic/boreal region using remote sensing to assess the system as it exists today, compare it with the past and predict the future.
- SDT Member Comment – In a broader perspective, ecosystem services are the best way to conceptualize what is in the revised executive summary. NASA has a remote sensing advantage and this could be used to test hypotheses with relevance to ecosystem services to local people.

Diane W.– While the team discussed the vulnerability of carbon cycle processes/states/resources in the roundtable discussion, there was little mention of ecosystem vulnerability and services. These are important parts of the study and we need to determine how to reconcile these different perspectives in the project.

- SDT Member Comment – Changes to carbon lead to changes in climate and alter ecosystem vulnerability, thus both issues would need to be addressed in the project.
- SDT Member Comment – Ecosystem services is a broad theme, both the vulnerability issue and the scaling issue are within it. It is important to consider how processes at the regional scale alter the carbon cycle and how these changes will affect ecosystem services.
- Eric K. – With ABoVE, we are addressing vulnerability across multiple scales, looking at ecosystem services instead of one characteristic is helpful.
- SDT Member Comment – Scaling is important too. Looking at processes both top-down and bottom-up is important to understand how the system is adjusting across time.
- SDT Member Comment – ABoVE will need to address more than just carbon. The first question of the revised executive summary discusses vulnerability.
- SDT Member Comment. – Potential collaborators (such as the Alaska Conservation Cooperative) will be more interested in a project with a broad theme than a project focused on the carbon cycle alone. ABoVE should consider understanding change detection and how this can be used to assess ecosystem resilience so that others groups can see how ABoVE could fit their interests.
- Eric K.– We need to consider not only the magnitude of feedbacks, but also the processes driving feedbacks.

- SDT Member Comment – Native interests are linked to carbon and water but are driven by their current needs. In conversations with the intertribal watershed community, they have stressed the importance of understanding water availability and quality and how changes in these may affect transportation, fish production and other subsistence issues.

Suggestion: Read the Alaska and the Arctic section of National Climate Assessment
(<http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap22-alaska.pdf>)

Diane W.– Five new investigators selected to do pre-ABOVE work. See above.nasa.gov for details.